Title: Custom Creations

Brief Overview:

> Students will apply their knowledge of area, perimeter, measurement, and use of a safety compass to design a "courtyard" area. They will work cooperatively and use these skills to design a scaled-down model of flower beds (with patterns) and picnic tables (with a given radius) to be placed in a 27 foot by 21 foot area. They will utilize one-inch grid paper to create their model.

Links to NCTM 2000 Standards:

- **Standard 1: Number and Operation**
  Mathematical instructional programs should foster the development of number and operation sense so that all students use computational tools and strategies fluently and estimate appropriately.

- **Standard 3: Geometry and Spatial Sense**
  Mathematical instructional programs should include attention to geometry and spatial sense so that all students analyze characteristics and properties of two dimensional geometric objects; and use visualization and spatial reasoning to solve problems both within and outside of mathematics.

- **Standard 4: Measurement**
  Mathematical instructional programs should include attention to measurement so that all students understand attributes, units, and systems of measurement; and apply a variety of techniques, tools, and formulas for determining measurements.

- **Standard 6: Problem Solving**
  Mathematical instructional programs should focus on solving problems as part of understanding mathematics so that all students build new mathematical knowledge through their work with problems; develop a disposition to formulate, represent, abstract, and generalize in situations within and outside of mathematics; and monitor and reflect on their mathematical thinking in solving problems.

- **Standard 7: Reasoning and Proof**
  Mathematical instructional programs should focus on learning to reason and construct proofs as part of understanding mathematics so that all students recognize reasoning and proof as essential and powerful parts of mathematics; make and investigate mathematical conjectures; and develop and evaluate mathematical arguments and proofs.

- **Standard 8: Communication**
  Mathematical instructional programs should use communication to foster an understanding of mathematics so that all students organize and consolidate their mathematical thinking to communicate with others; express mathematical ideas coherently and clearly to peers, teachers, and others; extend their mathematical knowledge by considering the thinking and strategies of others; and use the language of mathematical as a precise means of mathematical expression.

- **Standard 9: Connections**
  Mathematical instructional programs should emphasize connections to foster an understanding of mathematics so that all students recognize and use connections among different mathematical ideas; and understand how mathematical ideas build on one another to produce a coherent whole.

- **Standard 10: Representation**
  Mathematical instructional programs should emphasize mathematical representations to foster an understanding of mathematics so that all students create and use representations to organize, record, and communicate mathematical ideas; and use representations to model and interpret physical, social, and mathematical phenomena.

Links to National Science Education Standards:

- **Life Science**
  Students will learn in these activities about characteristics of organisms, life cycles of organisms, and organisms and environments.

Grade/Level:

Grades 4 and 5

Duration/Length:

3 to 4 days

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Measurement (customary)
- Scale
- Closed geometric figures
- Creating a circle with a given radius using a safety compass
- Perimeter and Area
- Patterns
- Persuasive business letter

Student Outcomes:

Students will:

- apply their knowledge of perimeter and area in real - life situations.
- create a scaled down model of an area using customary units (for ex. 1 sq. in. = 1 sq. ft.).
- identify and create patterns within a given area.

Materials/Resources/Printed Materials:

- Bulletin board paper
- Square inch grid paper (copy attached)
- Scissors
- Rulers and yardsticks
- Linker (Unifix) cubes (If these are unavailable, copy the square inch grid paper onto colors according to your school colors.)
- Safety compasses
- Glue
- Markers
- Student and Teacher Resource Sheets

Development/Procedures:

Day #1:

1. Place a transparency of the vignette introduction on the overhead projector. (Teacher/Student Resource Sheet #1) Read the vignette aloud as a class. Discuss what a model is and how they are used. What occupations use models? How are they used?
2. Ask the students to state their task. Have them do some problem solving and think-aloud discussion with their tables about the approach they could take to do this task. What will they need to do? What will they need? Discuss as a class.
3. Distribute one copy of the *Reading to Perform a Task* directions (Student Resource Sheet #2) to each team (group of four - create groups of three or five when necessary).
4. Have each student read through the directions silently and think about what they will be doing. Ask if anyone has any questions and discuss as necessary.
5. Distribute the materials (pre-made into packets) to each team.
6. Display a transparency of the scoring tool (Teacher Resource Sheet #2) on the overhead. Review the criteria and allow the students approximately 30 minutes to complete the task.
7. Score the templates according to the Teacher Resource Sheet #2 scoring tool.
Note: It would be very helpful for the teacher to create a model of his/her own to be used for modeling purpose throughout the unit.

Day #2:

1. Warm-up - Have the students respond to the prompt: List the basic steps that you and your teammates followed to create your template yesterday. (This can be completed on lined paper or in a journal.)
2. Distribute Student Resource Sheet #3 to each student. Give each team a packet of Linker (Unifix) cubes and one sheet of 1 inch grid paper (Student Resource Sheet #2a) for each person.
3. Display a transparency of Student Resource Sheet #3 on the overhead. Read over the directions. Discuss any questions. You may choose to assign a polygon to each member of the team or have them decide as a team on their own.
4. Explain to the students that they will be turning in five grids. Four of the grids will be with given areas and perimeters and one will be with the area and perimeter of their choice.
5. Score the five polygons according to the scoring tool that is Teacher Resource Sheet 2.

Day #3:

1. Warm - Up: Explain the *Guess and Check* strategy that you used yesterday to create your two dimensional closed polygon with a given perimeter and area. (Students may respond on lined paper or in a journal.) Discuss answers.
2. Redistribute the team templates, cut out circles, and polygon drawings from the previous day.
3. Direct the students to do the following: Have students decide, as a team, how they would like to arrange the flower beds and tables in their courtyard model. Make sure they use the entire space and arrange it in an aesthetically pleasing manner.
4. Once they have decided on a mutually agreeable model, have them glue the tables and outline the flower beds onto their template.
5. At this time, the students will be ready to create their patterns with the "flower bulbs". Distribute a *Patterns* sheet (Student Resource Sheet #4) to each student. This sheet allows the children time to practice and review patterns while they create patterns on a grid. Review patterns as necessary.

6. As a team, the students will create patterns within their flower beds. Have the students use linker (Unifix) cubes (according to your school colors) to arrange a pattern in each polygon. You may want to tell them to skip a square inch between each bulb or just do the border. They can only place one bulb in each square. Some polygons may have more than one pattern within them as a result of their shape. (Note: If they fill every square, they will need to request a donation of more bulbs.   Therefore, they will be less likely to be given the donation.)

7. Once they have all agreed on the patterns, they may write the color letter into the proper square according to their pattern. (For example, blue = B, white = W) As an alternative, they can color the pattern with crayons.

8. Use the scoring tool to assess the students' patterns.

Day #4:

1. Redistribute the "courtyard" models to each table.

2. Revisit the vignette by placing the transparency on the overhead projector.

3. The students are ready to calculate the number of bulbs needed for their flower beds and to write their persuasive letters to Garden-Mart.

4. Model the process for adding up the total number of each color bulb. Have the students write the total of each color for each polygon. Finally, have them come up with a total sum.

5. Distribute a copy of Student Resource Sheet #5 to each student. Review the directions for organizing their ideas for persuading the manager of Garden-Mart to donate the bulbs.

6. Brainstorm ideas in partners and have the students fill in their webs.

7. Review directions for their letter and the scoring tool, which is a checklist that is included in the directions on the student resource sheet.

8. Allow the students time to write their rough drafts for their letters. (See *Extensions* section for further options.)

Performance Assessment:

- Students will be assessed on their completed template according to the *Reading to Perform a Task* directions on Student Resource Sheet #2. (See scoring tool on Teacher Resource Sheet #2)
- Students will be assessed on the tables that they have created using the *Guess and Check* strategy. (see scoring tool on Teacher Resource Sheet #3)
- Students will be assessed on the patterns within their flower beds. The patterns are drawn onto the model using the proper color of crayons. (Note: There will be more than one pattern in some of the flower beds. As long as the students can explain the pattern, it is correct.) (see scoring tool on Teacher Resource Sheet #4)
- Students will be assessed on the persuasive letter that has been written to Garden-Mart. (See scoring tool on Teacher Resource Sheet #5)
- Students will be assessed on an ongoing basis through teacher observation, participation, and cooperative group effort.

Extension/Follow Up:

- Guide the students through the editing and revision stages of the writing process. Complete the business letters to your local store and send them. Use Student Resource Sheet #5c. Once you receive your donation, you can plant your "courtyard".

- Hang the model "courtyards" in the lobby area or cafeteria of the school. Invite teachers to bring their students on a gallery walk of the models. Have each student vote on their favorite model by placing a ballot into a can located near the model. A continuing activity will involve tallying and graphing the results of the survey. Send the letters to Garden-Mart and actually create the "best courtyard" in an area around the school.
- Students may create a model for a flower bed in their own yard at home by setting their own areas and perimeters. Possibly use cm and m for metric measurement instead.

Authors:

Tamara Sellman
Baltimore Highlands Elementary
Baltimore County, Maryland

Melissa Conrad
Baltimore Highlands Elementary
Baltimore County, Maryland

Custom Creations
Designing a Model Courtyard

The fourth grade has been asked to make improvements in the school courtyard. Your class has decided to put four flower beds in a specified area. Within these flower beds, we will be planting bulbs that return on a yearly basis. These flowers are called perennials. Unfortunately, you have not been given any funds, so you will need to ask for a donation. You will be writing a persuasive business letter to the manager of Garden-Mart asking him/her to donate the bulbs.

To show our school spirit, we have decided to use flowers that represent our school colors. Over the next few days, you will be planning and calculating the number of bulbs that will be needed.

Custom Creations
Reading to Perform a Task
Building the Template

Materials:

- Large sheet of butcher paper (Any color)
- 7" x 9" squared paper (9 sheets per group)
- Safety compass
- White drawing paper
- Rulers and Yardstick
- Scissors
- Glue stick
- Pencil

Procedures:

1. First, measure a 21" x 27" sheet of butcher paper and cut it out.

2. Second, lay the sheet of butcher paper on a flat surface with plenty of working space.

3. Next, using your scissors cut around the border of the nine 7" x 9" squared sheets of paper.

4. After that, glue the 7" x 9" squared sheets of paper to the 21" x 27" sheet of butcher paper. Before gluing, be sure to center the 7" x 9" squares in rows of three and columns of three leaving at least a two-inch border around the squared paper. Be sure the rows touch and line up evenly, but do not overlap!

5. Then, using a clean sheet of white drawing paper, create four circles, each with a two inch radius, using your safety compass.

6. Finally, place the circles on the graph paper but do not glue them on.

7. Now, you have a scaled down template of your future courtyard with four flower beds!

Building the Template
Scoring Tool

_____   • A piece of butcher paper that measures 21 x 27 in.
_____   • The 7 x 9 in. squared paper has been centered onto
              the butcher paper in three rows and three columns.
_____   • Four equal circles with two inch radii have been
              correctly drawn and cut out using the safety
              compass.

Team Members' Names: _____

                      _____

                      _____

                      _____

Date: _____

Building the Template
Scoring Tool

_____   • A piece of butcher paper that measures 21 x 27 in.
_____   • The 7 x 9 in. squared paper has been centered onto
              the butcher paper in three rows and three columns.
_____   • Four equal circles with two inch radii have been
              correctly drawn and cut out using the safety
              compass.

Team Members' Names: _____

                      _____

                      _____

                      _____

Date: _____

Custom Creations
Guess and Check
Perimeter and Area

Directions:

- Each of you will receive a bag of linker cubes and a grid sheet of one inch squares.
- Using the guess and check method, your task is to identify four closed two dimensional polygons with a specified perimeter and area.
- You will be working as a team. Assign one polygon to each team member.
- After you have found the polygon with the assigned area and perimeter, draw it on your piece of graph paper.
- Write: Area = _____ and Perimeter = _____ at the top of the page in the border. Fill in the blanks with your area and perimeter.
- Write your name in the bottom border of the page.
- Be sure to check your teammates' polygons.

	Polygon #1	Polygon #2	Polygon #3	Polygon #4
Perimeter	22 in.	24 in.	24 in.	22 in.
Area	28 sq. in.	24 sq. in.	33 sq. in.	26 sq. in.

Now, as a team, construct one two-dimensional polygon with a perimeter and area of your choice. (Hint: Be sure to include your units of measurement! Also, make sure that your polygon will fit on your template with the other four polygons.)

Polygon #5

Perimeter: _____   Area: _____

Custom Creations
Guess and Check
Scoring Tool

1 point for each of the following:

_____ Figure is a closed two-dimensional polygon.

_____ Figure has the correct area identified.

_____ Figure has the correct perimeter   identified.

_____ = Total points out of 3

Custom Creations
Patterns

Using the space below, draw a closed polygon that is similar to one of the polygons on your model. Then, use crayons to create a pattern in your flower bed. You can only place one bulb in each square. Skip a square in between each bulb or just do a border pattern.
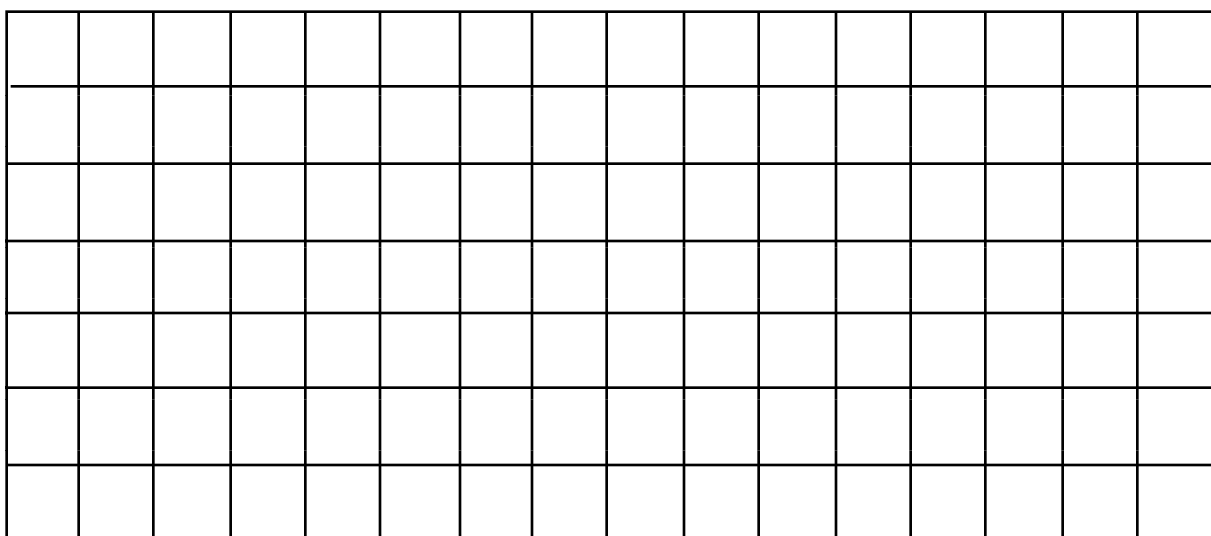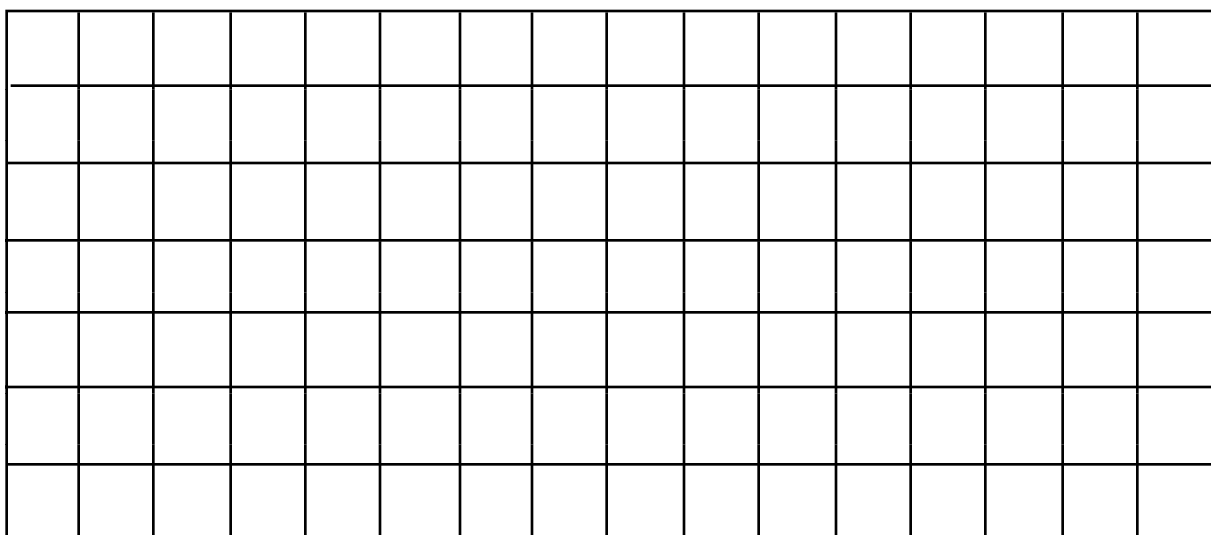
Custom Creations
Patterns
Scoring Tool

1 point for each of the following in each polygon:

_____ Patterns are correctly drawn inside the figure (0-5 points).

_____ Patterns either skip spaces or are drawn around the border
(0-5 points).

_____ Only one bulb has been placed in each square (0-5 points).

_____ = Total points out of 15

Custom Creations
Writing to Persuade
Business Letter

Using the organizer below, brainstorm and list your persuasive
reasons for needing a donation of bulbs from Garden-Mart.
Discuss your reasons with a partner.

Persuasive

Reasons
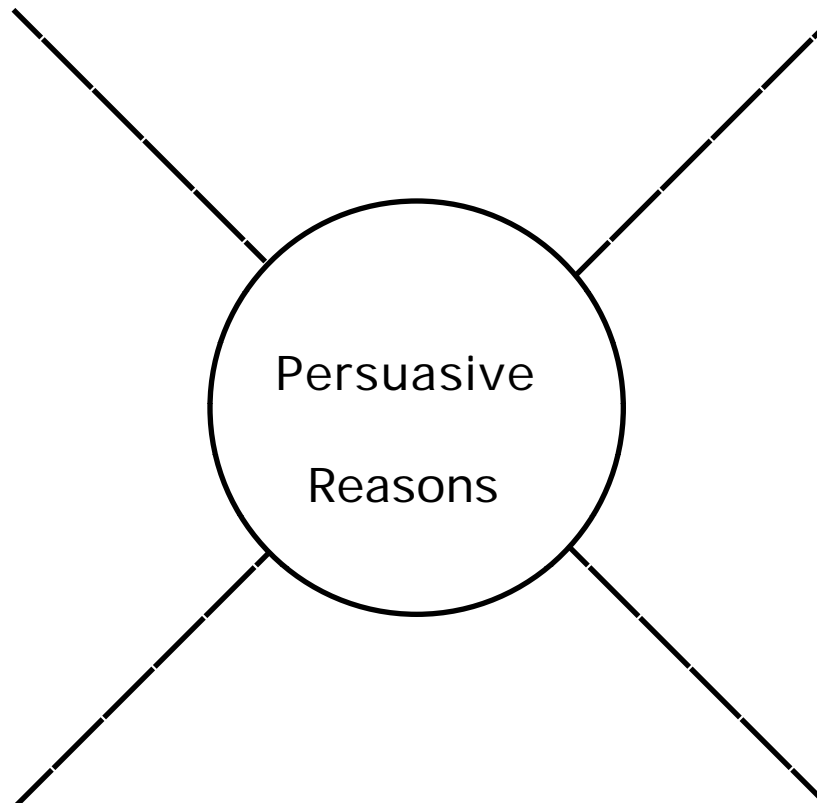
Customs Creations
Writing to Persuade
Business Letter

You are now ready to write your persuasive letter to Garden-Mart. Using the information from your web, compose a rough draft of a letter to the manager. Be sure to include the following points:

- Introduction including your name and the location of your school

- The number of bulbs that you need of each color

- At least two persuasive reasons with an explanation for each

- Use of proper business letter format

- Remember to use appropriate language

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Custom Creations
Writing to Persuade
Scoring Tool

3 Points =   Letter is written in proper business letter format.
Letter includes introduction with name and location of school.
Letter includes two persuasive reasons with accurate explanations.
Letter includes appropriate language.
Correct spelling, capitalization, punctuation, grammar are used most of the time.

2 Points =   Letter is written in proper business letter format.
Letter includes introduction with name and/or location of school.
Letter includes two persuasive reasons with partial explanations.
Letter includes appropriate language some of the time.
Correct spelling, capitalization, punctuation, grammar are used most of the time.

1 Point =   Letter has most of the proper business letter format components.
Letter includes introduction with name and/or location of school.
Letter includes one persuasive reasons with a partial explanation.
Letter includes some appropriate language.
Correct spelling, capitalization, punctuation, grammar are used some of the time.

0 Points =   Letter is unclear or does not follow given directions.